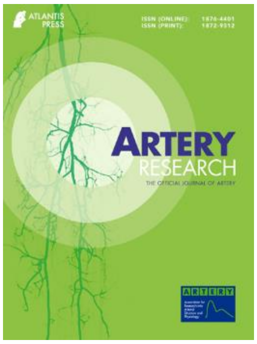

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2.1: COGNITION IN RELATION TO THE RETINAL MICROCIRCULATION IN CHILDREN BORN PREMATURELY OR AT TERM

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Conclusions: Higher zBMI associated higher standardized arterial blood pressure, stiffness levels, diameters and thickness. Hemodynamic parameters presented the stronger associations with zBMI variations.

Oral session II — Young Investigator Session

2.1

COGNITION IN RELATION TO THE RETINAL MICROCIRCULATION IN CHILDREN BORN PREMATURELY OR AT TERM

Fangfei Wei [1], Anke Raaijmakers [2], Zhen-Yu Zhang [1], Theun Pieter van Tienoven [3], Qi-Fang Huang [1], Wen-Yi Yang [1], Lutgarde Thijs [1], Harry Struijker-Boudier [4], Peter Verhamme [5], Karel Allegaert [2], Jan Staessen [1]

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Background: The retinal microvasculature can be visualized noninvasively and mirrors the status of the cerebral vasculature. We therefore investigated in 93 prematurely born infants (birth weight < 1000 g) and 87 controls born at term whether neurocognitive performance at ~ 11 years is associated with the diameter of retinal microvessels.
Methods: We post-processed retinal photographs by a semi-automated software (Singapore I Vessel Assessment, version 3.6) and administered the Wechsler Non-Verbal test, Dutch version (Pearson, The Netherlands) to estimate the intelligence quotient (IQ) by combining matrix reasoning and spatial span.
Results: Compared with the controls, cases had lower IQ (92.5 *vs.* 108.7; $P < 0.001$), smaller central retinal arteriolar (CRAE; 162.7 *vs.* 174.0 mm; $P < 0.001$) and venular (CRVE; 234.7 *vs.* 242.7 mm; $P = 0.003$) diameters and CRAE/CRVE ratio (AVR; 0.70 *vs.* 0.72; $P = 0.002$) and lower body mass index (17.0 *vs.* 17.7 kg/m^2; $P = 0.044$), but higher mean arterial pressure (82.7 *vs.* 77.7 mmHg; $P < 0.001$). In all children, the effect sizes associated with a 1-SD increase in CRAE were +3.87 ($P < 0.001$), +1.80 ($P = 0.004$) and +2.26 ($P = 0.003$) for total IQ, matrix reasoning, and spatial span, respectively. In models adjusted for body mass index and mean arterial pressure, these estimates were +3.21 ($P = 0.009$), +1.57 ($P = 0.020$), and +1.84 ($P = 0.024$), respectively. The associations of IQ and matrix reasoning with AVR also attained significance ($P \leq 0.031$).
Conclusions: In conclusion, our findings suggest that underdevelopment of the microcirculation in prematurely born children might have lasting effects on their cognitive performance.

2.2

HEART STRUCTURE AND VASCULAR FUNCTION IN YOUNG PATIENTS AFTER ENDOVASCULAR REPAIR FOR BLUNT THORACIC AORTIC INJURY

Paola Vallerio [1], Ilenia D'Alessio [2], Alessandro Maloberti [1], Marisa Varrenti [1,2], Simone Maggioni [2], Valentina Cantu [2], Marco Carbonaro [2], Maria Cristina Ferrara [2], Elisa Spada [2], Bruno Palmieri [3], Alfredo Lista [3], Cristina Giannattasio [1,2]

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Objective: Thoracic Endovascular Aortic Repair (TEVAR) currently represents the gold standard of treatment for Blunt Thoracic Aortic Injury (BTAI). Nevertheless, there is an ongoing debate surrounding its safety and efficacy and its subsequent CV effects. The present study is aimed at assessing heart and aortic structure and function after TEVAR in BTAI patients
Method: In 20 patients (18 men, age 41 ± 14 years) treated with TEVAR (11 Gore-CTAG, 9 Medtronic-Valiant) after BTAI, between 2004—2015, after a median follow-up time of 3 years (range 12—1 years; T1) we evaluated BP, cf-PWV (sphygmocor) and Left Ventricular Mass Index (LVMI) on echocardiography.
Results: At baseline, all the patients were normotensive; At T1 despite mean normal BP value ($131 \pm 12/85 \pm 10$) 11 patients (55%) were hypertensives. Also LVMI ($81{,}84 \pm 28{,}11$ g/m^2) and PWV ($7{,}58 \pm 1{,}48$ m/s) mean values were within the normal range. When patients were divided accordingly to the used graft patients treated with Medtronic-Valiant showed a significantly higher LVMI (97.17 ± 35.78 vs 69.58 ± 11.24 g/m^2; $p < 0{,}05$) and PWV ($7{,}78 \pm 1{,}74$ vs $6{,}45 \pm 1{,}54$ m/s; $p < 0{,}05$) compared with those treated with Gore-CTAG. Same figures were founded when patients were divided accordingly to the treating time with those treated more than 3 years before the evaluation that showed higher LVMI ($91{,}16 \pm 34{,}73$ vs $70{,}20 \pm 9{,}44$ g/m^2; $p < 0{,}01$) and PWV ($7{,}50 \pm 1{,}98$ vs $6{,}38 \pm 1{,}04$ m/s; $p < 0{,}05$).
Conclusions: TEVAR for BTAI is associated after some years with the development of hypertension and heart and vascular alterations. The presence of TEVAR modify aortic functional properties and induce in young subject an increase in BP and LVMI probably related to the presence of a rigid aorta.

2.3

BIOMECHANICAL AND STRUCTURAL QUANTIFICATION OF VASCULAR DAMAGE: A UNIQUE INVESTIGATION OF STENT IMPLANTATION

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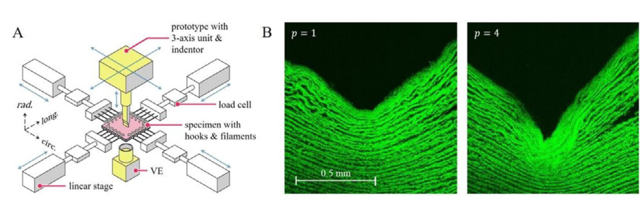
The most challenging complication after coronary stent implantation is in-stent restenosis [1], which is mainly caused by mechanically induced injuries due to overloading. From a biomechanical point of view, the processes occurring inside the arterial tissues during stent implantation (SI) is rather unknown.
This study shows a novel approach to quantify vascular damage due to SI a multi-scale examination of coronary arteries with generated injuries using a unique experimental in vitro setup.
The setup consists of a biaxial tensile testing stage to apply physiological loads on rectangular specimens of coronary arteries and a triple-axis-unit, which allows the indentation of stent struts into arterial tissues under a specified pressure (Fig. A). In addition, the multi-scale investigation of the mechanical and structural responses of the resulting lesion, following the protocol of Sommer et al. [2], is carried out by calculating Cauchy stresses and analyzing healthy and injured specimens with second harmonic generation (Fig. B) and electron microscopy.
The results indicate that the usually wavy collagen fibers straightened, compress and align around the lesion (Fig. B). In addition, the evaluation of the material characteristics reveals a significant softening of injured tissues.
Fig. A: Design of the experimental setup, showing a biaxial tensile testing stage (white parts) and the triple-axis-unit for indentation tests (yellow parts).
Fig. B: Sectional view through the tissue perpendicular to the lesion. The SHG images show collagen fibers of specimens from a 6-months-old porcine descending aorta responding under different pressures (1 and 4 MPa).



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